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SCIENTIFIC TEETOTALISM.

APPENDICES

TO THE

ILLUSTRATED HISTORY OF ALCOHOL;

EXHIBITING A VIEW OF THE

ACCORDANCE OF TEETOTALISM WITH
RECENT DISCOVERIES IN
ORGANIC CHEMISTRY,

AND EXPLAINING

THE MODUS OPERANDI OF ALCOHOL;

FIRSTLY,

ON THE FUNCTION OF RESPIRATION,

AND, SECONDLY,

IN THE FORMATION OF FAT.

The Illustrated History of Alcohol.

APPENDIX A.

EXTRACTS *from the* MEDICAL DISCUSSION *held between* DR. FREDERIC R. LEES, *and* W. JEAFFRESON, ESQ., M.R.C.S., *showing the harmony between Teetotalism and the theories of Professor Liebig, and the organic chemists.*

Orrgin of the discussion.

The Discussion originated in a conversation between Mr. Wm. Jeaffreson, Surgeon, and Mr. Samuel Fruer, Architect. Mr. Jeaffreson observed, that "Teetotalism had assumed such a daring, that *he*, as a medical man, could not put up with it, without rebuke"; and presented his respects to R. D. Alexander, Esq., of Ipswich, as President of the Suffolk Temperance Society, saying, "that he would feel most happy, the first fitting opportunity, publicly to meet any of the Temperance Agents or others, to discuss the Temperance Question; or, rather, to inquire whether the Temperance Lecturers are sufficiently acquainted with the medical or physiological effects of alcohol upon the human system, or know anything of the laws, or basis, upon which nutrition is carried on. If teetotalers could remove the moral evil of drunkenness, they did well, but the physiological department they *cannot know* anything about—that must be left entirely to the medical profession to decide!"

The challenge was readily accepted by Mr. Fruer; and Dr. Frederic R. Lees, was invited to take up the gauntlet thus thrown down. This gentleman having accepted the invitation, preparations were made for the discussion; which excited great interest in the town and neighborhood. The Town Hall was taken for the purpose, by the Teetotalers, and bills were issued, announcing that on Wednesday, the 29th March, 1843, Dr. Lees would open the discussion by a Physiological Lecture, explaining the physical effects of *alcohol* upon the human system, illustrated by large drawings of the stomach, in health and under alcoholic disease; "*to which lecture* Wm. Jeaffreson, Esq., Surgeon, of Framlingham, *has proposed to reply.*"

The audience consisted of about 700 persons, admitted by tickets. About seven o'clock P. M., the chairman called upon Dr. Lees to open the business of the meeting, who occupied nearly two hours in adducing the evidence of experience, of authority, of facts, and of direct experiment, in proof of the position *that alcoholic beverages are injurious to the human frame.*

Objections of the opponent.

Mr. JEAFFRESON then addressed the meeting for upwards of an hour, during which he was listened to with great attention by the teetotalers, though three-fourths of his speech had *no bearing whatever* upon the physiological effects of alcohol.

1. "I had been called in, professionally, to a young person in the town, and had prescribed alcoholic liquor, which the mother refused to give. This circumstance had given rise to those statements which had issued in the present meeting.

"In the case of recovery from a *fever* in that person, I had ordered him to

Objections.

be restricted to a *simple diet*, and had prescribed *porter* for the purpose of giving *power* to the vessels to *contract!*

2. "It is quite impossible that *un*instructed persons can understand this subject, which involves the consideration of the nicest points in physiology, pathology, and organic chemistry!

3. "I contend for the moderate use of alcoholic drinks, NOT HABITUALLY, but *under certain circumstances.*

4. "If we do not understand the *elements* of the *blood*, we cannot understand the operation of these agents!

"Blood was made up of the elements of *proteine*, (so called from *proteuo*, 'I take the first rank.') Its composition in one hundred parts was, carbon 55, hydrogen 7, nitrogen 16, oxygen 22. This *proteine* was all the *nutritious part* of blood.

"All the elements of proteine are found in vegetables: therefore the vegetable substances supply us with the essential elements for the formation of blood.

5. "But besides the *nutritious* elements of food, animals require substances composed of oxygen, hydrogen, and carbon, without nitrogen, the carbon of which unites with the *oxygen* inspired, and produces *animal heat.* For this purpose we must breathe pure air, which is composed of eighty parts of nitrogen, and twenty parts of oxygen, for were there only ten per cent of oxygen, we should be suffocated.

"Besides the *proteine* principle in vegetables, which is the nourishing part; nature has plentifully supplied us with other compounds, as gum, sugar, starch, oil, *wine*, *beer*, *alcohol*"—

Alcohol not in nature.

[Dr. LEES—Does *nature* supply alcohol?—Are wine and beer found in *vegetables*?]

Mr. JEAFFRESON—"No—but they are elements of *respiration;*—and, *under certain circumstances*, NECESSARY *to respiration!*

6. "This alcohol, as an element of respiration, is necessary, under certain circumstances, to preserve the body in a state of health—*to protect it from the action of oxygen!*"

(First case.) "A Suffolk agriculturalist,—*a hedger and ditcher*,—in active labor, with his feet wet, and exposed to a temperature much below that of his own body, may take a quart of good mild beer during the day with advantage!—(Loud stamping in the gallery.)—The *small* quantity of alcohol contained in it, being, *under these circumstances*, resolved into carbonic acid and water!—the *vegetable food* which he is always confined to, being only sufficient, with seven hours rest, to supply the *waste* of his body sufficiently to resume his labor on the following day!

(Second case.) "The Samoyedes are a nation of Northern Tartars, who are exposed to intense cold, and who will consume 10lbs of flesh, a dozen of tallow candles, and a quart of train oil daily. *Brandy* is *essential* to them; they can take a pint of it with apparent impunity.

(Third case.) "In certain circumstances of the constitution, when the powers of *digestion* and *assimilation* fail, as after an attack of *typhus fever*, I recommend it to supply the deficient *elements of respiration,* and as a *medicine* to give *tone* for a time!"

Reply.

DR. LEES said—"At this late hour of the night, I shall not enter into any consecutive and detailed examination of Mr. Jeaffreson's address—in fact, much of it has nothing to do with the question of teetotalism at all; and of that which has, some is perfectly correct, and harmonious with it in the main, while other parts, especially that relating to Liebig's theory of *respiration*, is, in its true bearing, misunderstood and misrepresented. This I shall show you on the ensuing evening.

Does Mr. Jeaffreson admit, that *alcohol, being destitute of one essential element of the nourishing part of blood*, nitrogen, *cannot possibly be nutritious?*"

Mr. JEAFFRESON—Who ever contended that it was?

Dr. Lees. "Who? Why, Sir, nearly the whole world. Are we not every day told of the *strengthening* and *nourishing* properties of these drinks?

Alcohol cannot nourish.

"Now, Gentlemen, mark the admissions of Mr. Jeaffreson. He has distinctly allowed, *first*, that alcohol cannot possibly contribute to the nourishment of the body; and, *second*, that it is not to be used *habitually*, but only moderately *under certain circumstances!*

"But what has he said to show that alcohol is not a poison? Has he refuted one fact, or replied to one argument of my opening address? *Not one!*"

Mr. Jeaffreson. I allow that 2½ ounces of undiluted alcohol *is* a poison!

Dr. Lees. "My proofs went to show that *all* alcohol was poison, and against that array of argument and authority we have the unsupported assertion of Mr. Jeaffreson! I am told, indeed, that it is an *element of respiration*. Well, now, you have Mr. Jeaffreson's authority for this; to-morrow night I will show you what the theory itself is worth; at present it is purely a question of opinion. Doubtless Mr. Jeaffreson's opinion is worth something, but I ask the gentleman himself, if he can pretend to be as high an authority in this matter as Dr. Pereira, the examiner of *Materia Medica*, in the London University?"

Mr. Jeaffreson—I do not pretend to be.

Admissions of Dr. Pereira.

Dr. Lees—"Well, then, Gentlemen, with reference to this alleged use of alcohol in promoting the function of *respiration*, and generating heat, what says Dr. Pereira? In a paper in the *Pharmaceutical Journal*, vol. II. pp. 184-5, he says—"The *tea*-total societies"—(thus evincing his ignorance of our real principles by mis-spelling our name, as if we were extraordinary *tea* drinkers!)—"have quite overlooked this use of spirit." He is wrong here too, for I have frequently exhibited its true relations (which are not exactly what he and Mr. Jeaffreson imagine) to the respiratory process. He adds—"It cannot be doubted that it undergoes some change in the animal economy, and *probably may* be made some use of." Granting, however, that this '*probably may*' be the case, it is evident that the sugar from which the alcohol is produced, at great cost, and loss, and labor, would answer the end as well, without producing any of the mischief. All that Mr. Jeaffreson's, or rather *Liebig's* theory would prove is this, that *after* a portion of spirit had acted as a poison on the stomach, the tissues, the liver, the heart, the lungs, and the brain, some portion of the poison is then made to answer the same purpose as would an equal portion of sugar, starch, or gum! "If" (says Dr. Pereira) "I had to point out the *injurious qualities* of alcohol, I think I could soon prove, that though it evolves heat in burning, it is AN OBNOXIOUS AND MOST EXPENSIVE FUEL. Consider its volatility, the facility with which it permeates membranes and tissues, and *its injurious operation*—BEFORE it is burnt in the lungs—*on the stomach, the brain, and the liver.* Remember, that though spirit burns and evolves heat, there are, *under ordinary circumstances*, other BETTER, SAFER, and CHEAPER combustibles to be burned in the vital lamp!"—Mr. Jeaffreson does not even pretend to put himself in opposition to so high an authority—and this authority, you perceive, is altogether in favor of teetotalism.

"Under ordinary circumstances"—says Dr. Pereira—"other better, safer, and cheaper" articles are to be had, than this poison;—but, says Mr. Jeaffreson, "the hedger and ditcher requires it!" Why, Gentlemen, I suppose that we have some thousands of these "hedgers and ditchers" included in the six millions of teetotalers in England, Scotland, and Ireland, who do very well without this element of respiration!"

Mr. Jeaffreson (interrupting)—"I know something of the habits of the Irish peasantry. These live principally on potatoes, which contain much gum, starch, and sugar, but not sufficient of the nitrogenised elements of *nutrition.* They are compelled to go to something like a corner cupboard, and bring out a black bottle containing something like *whisky*, and that not of the best sort either"—

Dr. Lees—"And does *whisky*, Sir, contain the nitrogenised elements of nutrition of which the potato is short?

Mr. Jeaffreson—(puzzled)—No—but it is an element of *respiration!*

Dr. Lees—"But has not the potato an abundance of that element?"

Mr. Jeaffreson—(much confused)—Yes!

Dr. Lees—"Then, why, in the name of common sense, must they take the *whisky?* If the potato have *too little* of the nourishing or nitrogenised principle, the whisky has *none at all!* Why then take it?"—

Mr. Jeaffreson here put on his hat, grasped his umbrella, and marched off the platform, at which signal great numbers of his friends (who during the cross-examination had been very noisy) also rose and left the meeting, which then broke up.

SECOND DAY.

A note of invitation was sent during the day, respectfully calling upon Mr. Jeaffreson, as a professed searcher for truth, to attend the lecture, and to hear his version of Liebig's theory examined, and *defend* the position he had assumed. He did not, however, deem it prudent to attend.

At seven o'clock a very respectable and select auditory was collected. A chairman having been appointed, Dr. Lees was again introduced to the meeting, and warmly greeted.

Dr. Lees' reply continued.

Dr. Lees then addressed the assembly for nearly three hours, during which he was listened to with the most marked attention. The following is an outline of the arguments employed.

"I proceed, at once to fulfil my previous pledge, by *first* examining in greater detail, as matters of fact, the objections and admissions made by Mr. Jeaffreson; and *secondly*, to illustrate the true relation between teetotalism and the new theories of the organic chemists,—a relation so imperfectly exhibited by Mr. Jeaffreson last evening. I maintain that all the great discoveries in chemistry and physiology, do most remarkably, and indeed necessarily must, support and strengthen the doctrines of total abstinence—since those doctrines are but the expressions of human *experience*.

The first thing which powerfully strikes me on reviewing the address of Mr. Jeaffreson, are the ruinous admissions he was compelled to make.

Alcohol cannot nourish.

1st. He admitted that *alcohol could not possibly nourish the body.* The nourishing elements of the blood, out of which the various fibres and tissues of the body are formed, are composed of *four* chief ultimate principles,—oxygen, hydrogen, carbon, *nitrogen*, or azote,—but alcohol contains only the first *three*, and therefore is deficient in one essential element of nutrition. Hence, alcoholic drinks cannot by any possibility, at least by virtue of their alcohol, strengthen the body, or repair the waste of one atom of the living fibre.

Alcohol a poison.

2nd. He distinctly admitted that *alcohol in its own nature*, undiluted alcohol, *was a poison.* But alcohol mixed with water does not operate *differently* from pure alcohol. The dilution may modify its *degree* of action, but it does not alter its *kind* of action. The experiments of Dr. Beaumont on St. Martin, and the experience of teetotalers, prove that all alcoholic drinks essentially operate in the same way upon the animal economy—that they *invariably* produce the same kind of morbid changes, and with very little difference as to their *ultimate* character. In fact, when pure alcohol is given, it becomes speedily mixed with water *in* the blood. Dr. Courten (1679), as related in the *Standard Temperance Library*, p. 20, says—"We injected into the crural vein of a dog five ounces of a strong *white-wine*, which made him very drunk, and little different from what a less quantity of *spirits of wine* would have done."—Its effects upon the circulation, I believe to be even more permanent, though doubtless it will not so strongly blister and burn the tissues of the stomach on its first contact. Our position is this—as far as alcohol operates *at all*, in any form, it operates as a *poison*.

All alcohol operates essentially alike.

3rd. Mr. Jeaffreson admitted also, that the vegetable principles supply us with the *essential* elements for the formation of the vital fluid, blood; fibrin, albumen, and caseine, on the one hand, for *nourishment;* gum, sugar, starch, oil, &c. on the other hand, as *elements of respiration.* But, he allows that vegetables do not contain *alcohol* ready formed; and hence we have a strong *à priori* proof, deduced from the wisdom and perfectness of nature's arrangements, that alcohol is not necessary. Had it been so, surely amidst the vast varieties of climate and circumstance in which man is found, nature would have furnished it! But while she *has* altered the kinds of food in various countries,—giving more of oxygen to the food of the tropics, and more of carbon to that of the arctic regions—adapting its composition to the wants of the animal economy, she has nowhere, and in no case, supplied us with *this* "necessary element of respiration"! If Mr. Jeaffreson is right, then is nature wrong!

Habitual use improper.

4th. He admits also, that *the moderate* HABITUAL *use of alcohol is improper.* He contends for its use only "under certain circumstances." Where those circumstances do *not* exist, therefore,—and comparatively few of us are "hedgers and ditchers" with deficient food, or persons recovering from typhus fever, and happily not any of us are half-naked Samoyedes, living amidst perpetual snows,—the use of mild beer, Bett's brandy, or brown stout, is unjustifiable. Is not this doctrine *virtually* equivalent to total abstinence from intoxicating beverages?

5th. Mr. Jeaffreson admits that "it is impossible that *un*instructed persons can understand the subject" of its *right use*, because that "involves the knowlege of such *nice points* in physiology, pathology, and organic chemistry." It ought, therefore, on his principles, to be very cautiously employed, and only under the prescription of those learned men who *do* understand these "nice points"! This contending for its use as a medical agent, "under certain circumstances" to be determined only by the doctor, not by the patient—is a strong admission in our favor. As Dr. Truman well observes, in his recent work on food, p. 190, "No disease can be cured without injury to the health, for *the remedies* employed for this purpose always cause some excessive and unnatural action in the body, which lessens its power." That is, all medicine is evil *per se*, or poisonous; it inflicts a lesser injury to avoid a greater. Thus, granting the alleged influence of alcohol as a medicine would only tend to establish its poisonous character; and therefore its unfitness to be employed in health, or as an ordinary beverage. Consequently, if it be *right* to use it as a *medicine*, it is WRONG to use it as a BEVERAGE!

All medicines evil *per se*.

I will now show you that FACTS plainly demonstrate that alcohol is neither necessary nor useful as an *element of respiration*, even under the "certain circumstances" supposed by Mr. Jeaffreson in his three extreme cases.

Beer not necessary in cold.

First case.—We are told that to the hedger and ditcher, with his feet *wet* and his body exposed to *cold*, a quart of mild beer is necessary to supply the elements of respiration, of which his vegetable food is deficient! Now if his food be deficient in the requisite elements—but it so happens that of these elements vegetable food contains more than beef or mutton—why not take more or better food? The ale for which he pays fourpence or fivepence, does not contain as much of those elements of respiration as a pint of milk or a piece of bread, for which he would pay one penny—that is, in the language of Dr. Pereira, the alcohol is a most *obnoxious* and most *expensive* fuel for the production of animal heat.—On inquiry, however, I find that these said Suffolk hedgers and ditchers, for whom this quart of mild beer is *so necessary*, do nevertheless not get it at their work—and yet they manage to *live on* after all! The "small quantity of alcohol" in mild beer, therefore, is *not necessary* to the hedger and ditcher.

Spirits unnecessary in Northern latitudes.

Dr. Scoresby (now vicar of Bradford), who had been engaged twenty-one years in the arctic whale fishery, in his evidence before Parliament on this subject,—in reply to the question, No. 4399, "Is it not the general impression that spirits are *more necessary* in cold climates than in hot?"—said, "It *is* a very common impression; but *from my own experience*, I can say that ardent spirits are NOT NECESSARY. I did not use ardent spirits myself, and I was *better*, I conceive, without the use of them."

W. Cobbett's testimony.

The late William Cobbett, M. P. for Oldham, in his younger days, was a soldier in Canada. In a letter addressed to the ladies of England, and dated January 17, 1820, entitled "A Plan for the promoting of Sobriety and Frugality," he thus gives his decided and conclusive testimony on this point.—

"It is said, as an excuse for the use of spirits, that they *keep out the cold*. Let a man once persuade himself of that, and he will soon find that they *keep off the heat!* That they drive out the heat, is very certain; for, in the northern parts of America, where the cold is so great that people are frequently *frost-bitten*, and are compelled to have their feet or hands cut off, it is a caution always given to those who are likely to be exposed to the severity of the weather, *not to drink any spirits before they go out*. And, though I have known many persons frozen to death, and a great many more to have their limbs cut off, I hardly recollect a single instance in which the suffering party had not taken spirituous liquors on his way, or before he went out. Spirits are very cheap in those countries. A bottle of rum for sixpence. Of course thoughtless men will use them. I have a hundred times gone out shooting or hunting upon the snow along with others, each of whom took a canteen of rum, while I took none. I used to *suck the snow*, which they told me would give me the pleurysie, but I found that I never had the pleurysie, and that many of *them* had. And as to ability to travel and to bear the cold, though many of my companions were much stronger and more active than myself, I always found that, at the end of the day, I was the freshest, and by far the most cheerful of them all.

"*All strong liquors*, be they of what sort they may, and *in an exact proportion to their strength*, tend to disable the frame from enduring the cold; tend to make the person *chilly*. The reason is this, that they have all an intoxicating effect. We clearly perceive that they *stupify the mind;* and at the same time they, in a greater or less degree, *benumb the body*. Consequently they tend to render it more susceptible of the injurious effects of cold."

Dr. Combe.

Thus *facts* overturn this hedging and ditching theory—and the best authority is also opposed to it. Dr. Andrew Combe, the celebrated writer on physiology and dietetics, says, "I believe that exposure to cold, wet, and fatigue, when of *frequent* occurrence or of long continuance"—just the case of the poor hedger and ditcher—"is *better supported by nutritious food*, good clothing, and pur air, *than by the use of fermented liquors;* and consequently I do not conside the latter necessary." *

The Samoyedes

Second case.—As we have been told that mild beer is necessary to the Suffolk rustic, so on going further north, we are told, on the same authority, tha "brandy is essential to the Samoyedes"! If I may presume that thes Samoyedes *had* any ancestors, I should like to know how *they* managed t live, some centuries ago, before brandy was introduced amongst them Mild beer is *necessary* to the hedger and ditcher, and strong brandy *essentia* to the rude Tartar, and yet, somehow or other, both contrive to live without it But why is it essential to them? "Because" quoth Mr. Jeaffreson, "the can take a pint of brandy with *apparent impunity!*" It would not, howeve follow, that Englishmen could take it with impunity; but, indeed, there is n evidence to show that they can do it either. Are these brandy-drinkers a stou healthy, and long lived race? No, on the contrary, they are a weak, pun and short-lived generation, and much of their physical and social degradatio may be fairly put to the account of this same brandy.—I admit, howeve that they may drink brandy with more impunity than we might, just on th same principle that a strong active laborer will receive *less harm* from a glas of ale or wine, than a weak or sedentary person. The reason is, in both case that the evil thing is sooner got rid of.—Brandy is no more necessary to th Samoyedes than mild beer to the Suffolk-man.

Nature gives fat, not alcohol.

Fatty-matter is the kind (food which nature has designed for keeping up the heat in man and othe animals in the high latitudes—*not alcohol*. Look at the wolves and bears i the arctic regions, surrounded by eternal snows and icebergs. How do *they* support respiration? Has the Polar bear learnt the art of distilling brandy? And if *he* can support respiration without this alcohol, so can the Samoyedes!

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* Vide Report of the committee of Aberdeen Presbytery, on intemperance.

Alcohol bad in recovery from fever.

Third case.—"*When* the powers of *digestion* and *assimilation* fail, as after an attack of typhus fever, *then* a little wine may be *prescribed.*" What for? Why, says Mr. Jeaffreson, first, "as an element of respiration," second, "to impart tone for a time"!

But we have already seen, that alcoholic drinks do not increase warmth, but on the contrary, decrease it, and render the body more susceptible of cold, and therefore wine is a bad element of respiration. We have also seen, that alcohol is not a tonic, but an irritant; it cannot, therefore, "impart tone," but must destroy it, and ought, consequently, to be most cautiously abstained from when the powers of digestion and assimilation fail. It hardens the food also, as well as weakens the digestive powers. Mr. Mayo, author of the *Philosophy of Living*, and late senior Surgeon to the Middlesex Hospital, opposes the use of stimulants in recovery from fever. He says;—"To those of naturally good stamina, who are convalescent after fever, or inflammatory attacks, the lightest nutriment alone is commonly necessary;—gruel, arrow-root, beef tea, with dry toast, calves' foot jelly, boiled whiting, and the like. *The stomach does not want, and will not bear, stimulating;* but it is weak and can chymify only the most digestible food; and that in small quantities. *Its tone is sure to return spontaneously.*" p. 59. Hence our teetotal surgeons found, on trial, that they could do *better* without this medicine, even in recovery from fevers, than with it.

Peculiar constitutions.

Dr. Cheyne, of Dublin, in his letter on wine and spirits, many years ago, justly observed, that "the benefits which have been supposed to flow from their liberal *use in medicine*, and especially in those diseases which were once universally, and are still vulgarly supposed to depend upon mere weakness, *have invested these agents with attributes to which they have no claim;* and hence, as we physicians no longer employ them as we were wont to do, we ought not to rest satisfied with a mere acknowledgment of error, but we ought also to make every retribution in our power for having so long upheld one of the *most fatal delusions* which ever took possession of the human mind!"—If, however, they *do* possess any medical virtues, then the *habitual abstainer* will most assuredly experience a greater amount of advantage from their medical use, than the moderate drinker possibly can, whose constitution has become hardened by their constant use. Speaking of wine, Dr. Christison says, that "the artificial states of the constitution produced by the habits of civilized life are *supposed* to render it for some people a necessary stimulant, especially during exposure to unusual fatigues." *(Dispensatory*, p. 943.) But what says the Professor to this supposition? "Very few constitutions of this kind *really* exist among those who are *willing* to think they themselves possess it." You see, Gentlemen, that Dr. Christison understands the secret—the patients are "willing to think" that they possess the peculiar constitution, because they *like the medicine!* "The habitual use of wine," says he, "is safest or most salutary when the habit is united with regular exercise out of doors," or, in plain English, is *least hurtful* in those constitutions and circumstances in which it is soonest got rid of—"and *most hurtful* where the occupation is sedentary, and the mind much exerted." Thus we see, that of all people, the weak, feverish, or studious, ought most carefully to refrain from wine.

I will now pass from facts to the theory of those facts, and unfold the true relations of alcoholic drinks to the laws of nutrition and the functions of respiration—involving those "nice points in physiology, pathology, and organic chemistry" of which you have heard so much said—and I undertake to show you, that the discoveries of Liebig and the organic chemists, rightly interpreted, perfectly accord with the principles of teetotalism.

IN THE LIVING TEMPLE of the healthy body three distinct sets of principles, The laws of the living temple described.

or laws, are in constant and harmonious operation; namely—the *physical*, the *chemical*, and the *vital*.

In the texture of the fibres and the construction of the bones, forming ropes, levers, pivots, and pulleys, and in the propulsion of the blood from the heart, we have examples of *mechanical powers* in the human machine.

Man, however, is not merely a physical or mechanical structure—he possesses a vegetative existence, exhibiting the varied phenomena of growth and decay, in the movements of every day and hour,—and, in this respect, he is subject to *chemical agencies* in common with the vegetable world. The circulating system supplies the chief medium for the development of these phenomena.

But, superadded to physical and chemical attributes, man possesses a higher life; he has a *vital principle* which regulates, modifies, and controls mere chemical agencies. This principle pervades every fibre and organ, but may be said to possess, in the highly organized *nervous system*, its peculiar and characteristic instrument.

The chemical and vital principles are, in their own nature, distinct and *opposite*, yet, by the wonderful power of God, they are made to combine, in animals, to the production of health and happiness. Life, vigorous and healthy life, is the *balance* or harmony of the conflicting powers—Disease is the encroachment of one on the domain of the other—Death is the final triumph of the chemical over the vital power.

In reference to these several principles, we find every thing in the external world wonderfully adapted and wisely arranged. All things requisite to the complete, continuous, and harmonious movement of the whole, is beneficently and bountifully supplied.

Every movement of a limb—every throb of the pulse—every beat of the heart—every thought of the intellect—every feeling of the soul—wears down a portion of this living temple,—disintegrates some part of the muscular or nervous system of the body or brain. Hence, to repair this daily and perpetual *waste* in all, and in the young to contribute also to the *growth* or increase of the mass, we see the necessity for the ceaseless supply of *new materials.* "Give us each day our daily bread." Food only can answer this purpose; food, therefore, is graciously given. This, strictly, is *nourishment*—that which contributes to the building up or repair of the living temple. But, of necessity, that only can do this which is identical, either in its proximate or ultimate principles, with the structure to be erected or repaired. "If one ask for bread, will you give him a stone?" Plants require for their nourishment the *ultimate* principles of which they are composed—namely, oxygen, hydrogen, and carbon, (which they get from water, and from the carbonic acid floating in the air,) and nitrogen, (yielded by the manure and air,)—which principles must be given up in their decomposed or inorganic form, ere they can become nourishment for vegetables. But exactly the *reverse* happens with animals, which have no power to appropriate and assimilate the inorganic or ultimate elements, as nourishment. Plants are the appointed means of gathering up the *ultimate* elements, and out of them composing the *organic compounds*, which serve as the nourishment of animals; while these, in return, such is the harmonious round of nature, *de*compose the organic substances, and thus supply the food of the plants!

Mutual harmonies of the vegetable and animal kingdom.

What is necessary for nourishment.

Fibrin, albumen, and caseine, are those quaternary compounds in food which alone can furnish *nourishment* to the frame—and hence, as alcohol is only a ternary compound, destitute of nitrogen, it could not possibly, in any degree build up the waste of one atom of the living temple.

On the contrary, I maintain, that according to the principles of Liebig, i ACTS AS A POISON, by *hindering the nourishment* and *impairing the strength* o the body.

"Change of matter."

You will have gathered from what I have said about the chemical, and it antagonist force, the vital, that the body is constantly undergoing COMPOSITION and DECOMPOSITION. Life, indeed, consists in the perpetual *building up* and

Transformation of tissue.

pulling down of the organs of life,—the bodily estate being, as it were, perpetually subject to *Conservative* and *Destructive* influences. One process is plainly as necessary as the other. If the chemical powers did not *pull down*, the vital powers would not *build up*—if no life were expended in *action*, no *waste* would occur, no *supply* would be needed.

We take food; observe its history. It is masticated by mechanical, digested by chemical agencies, but it is *assimilated* only by vital principles. Its elements become organized, and enter the blood, and by vital affinities supply the waste of dead matter, become a portion of the living organism, fulfil their appointed function, and in putting forth their *vital power* in action, lose it; become subject to *chemical agencies;* are transformed; pass away inert and dead; and are finally expelled by the excretory system. Such is the life of each atom and each fibre!—The health of the whole body consists in a rapid metamorphosis of its individual particles. Hence it is, that free exercise and fresh air, which contribute so powerfully to promote the transformation of the tissues, and the elimination of the dead or decomposed matter, are essential to perfect health. Thus the "CHANGE OF MATTER" in the body—the disintegration of the tissues—must *precede* the supply of new matter, or nourishment.

"All experience proves," says Liebig, "that there is, in the organism, *only one source of mechanical power;* and this is the *conversion of living parts into lifeless*, amorphous compounds." (*Animal Chemistry*, p. 243.)

Liebig, on poisons.

Now this distinguished writer makes a three-fold division of "medicinal and poisonous substances," namely, 1, metallic poisons which combine with certain parts of the body; 2, anti-septics, camphor, essential oils, &c., *possessing* "*the property of impeding or retarding those kinds of transformation*" known as fermentation and putrefaction; 3, such as "augment the energy of the vital activity of one or more organs; they *excite morbid phenomena* in the healthy body." (p. 171.) In p. 179, he speaks of *tobacco* as "a means of retarding the change of matter in the tissues;" and of "*brandy*, which, acting as an element of respiration, *puts a stop to the change of matter* by performing the function which *properly* belongs to the products of the metamorphised tissues." He, moreover, distinctly admits that such substances "also *arrest digestion* when taken into the stomach." Thus, on the principles of this philosopher, we find it admitted, 1st, that alcohol operates *as a poison* in two distinct ways; 2nd, that it retards the change of matter, consequently arrests digestion, and *prevents the nourishment* of the body, which requires the removal of old, and the supply of new and living matter; and 3rd, that it *diminishes strength* by destroying those conditions on which mechanical force depends for its development.

We have seen that the body is not merely a vegetable apparatus; it is also a nervous and *vital* structure, and requires *vital warmth*, as one of the conditions of its existence.

Origin of animal heat explained.

Life (as seen in the egg) is only developed under a certain temperature; which is just as necessary to its continuance as its commencement. Had man been merely a vegetable, the circulating fluid *might* have been as *cold* as the juices of plants; but as a *vital* being *warm blood* is essential to the process of nutrition and life. Accordingly we find that ample provision is made for securing this object in animals, under vast varieties of circumstance and climate. Animal heat, like that of the ordinary fire, depends upon *combustion;* a combustion, however, unattended with flame. Two things are requisite for its production, namely, a *combustible material* (fuel) and a *supporter of combustion* (oxygen gas). Thus, in the candle, lamp, and fire, you have the wick, the oil, and the wood, as fuel to be burned. But unless you allow a free access of *air* (containing oxygen) the candle or fire will burn dully, and if the air be totally excluded (as by putting a candle under a glass case,) the flame will rapidly go out; in fact, it will be *suffocated* by depriving it of oxygen, which *supports its combustion.* This is equally true of animal heat, and its generation in the animal machine. Now we find that the external world is arranged with beautiful adaptation to this new want of the living system. Our food furnishes not only the four-fold compounds for *nourishment*, but also certain three-fold compounds for *fuel.* The latter substances (such as gum, sugar, starch, fat, oil, &c.) are composed only of carbon, hydrogen, and oxygen; the former have nitrogen, or azote, in addition. Non-azotised food, however, is not the *only* source of animal fuel—for the nitrogenised or nourishing part of food, after it has become vitalized, eventually dies and becomes waste lifeless tissue. In the metamorphosis of this tissue, it is made to yield up its *nitrogen* or azote, which is carried off by certain excretory organs, when the remainder of its elements become elaborated in the liver, going to the formation of *bile*, and thus fulfilling indirectly, in their decay, the same uses as the non-azotised principles fulfil more directly. What wonderful economy and wisdom are displayed in these arrangements!

Uses of the liver.

Thus the food supplies (either directly in its non-azotised elements, or indirectly by the decay of the tissues formed and nourished by its nitrogenised principles,) all the fuel or *combustible materials* to be burned in the vital lamp. The *liver* may be viewed as a patent laboratory (or grate) wherein the fuel is collected and prepared, and reduced to the form best adapted for combining with oxygen, and producing animal heat.

Matter and means of respiration.

The questions now arise, *whence* do we obtain the oxygen or supporter of combustion, to keep the animal fire burning brightly?—and by what means is it *introduced* into the system?

The *oxygen* used for this purpose is chiefly obtained from the atmosphere, which contains about 20 per cent. of it. This, for nature is always right, is just the proper proportion for animals, departure from which would be injurious. Had the air only 10 per cent. of oxygen, we should be suffocated—and hence every habit or agent which prevents this *due supply*, must, as a constant condition, be pernicious.

Uses of the lungs.

This oxygen is *introduced* into the system by RESPIRATION. Hence, in the language of Liebig, p. 335, "animal heat is highest in those animals whose respiration is most active." The lungs and skin form the apparatus destined for bringing it into contact with the blood. Thus—just as, if there be sufficient fuel, the fire burns and glows vividly when you introduce an extra amount of oxygen, by the play of the bellows—so when, under the power of exercise, the natural bellows of the lungs have fullest play, the internal combustion proceeds most rapidly. The *iron* in the blood-globules is supposed to perform an important part in this process. Liebig calls them "CARRIERS OF OXYGEN."

The uses of iron in the blood

The iron absorbs oxygen in the lungs, becoming a *peroxide*, and conveys it through the arterial system, as an element essential to vital life;—in the capillaries, or hairlike extremities of the blood-vessels, where the arterial runs into the venous system, the vital globules yield up their oxygen; the iron then absorbs carbonic-acid, becoming a *protoxide*, passes on with the dark colored venous current to the lungs, and there yields up its carbonic-acid-gas, or foul air, which is expired; and thus it performs an important function in the purification of the vital fluid, in the conversion of poisonous-venous into arterial or nourishing blood. The *heat* elicited—the *change of matter* effected—and the *amount of strength* or force developed—may thus be measured by the quantity of *oxygen absorbed*, and of *carbonic acid* expelled.

Harmonies of the animal functions.

I may observe, that though this process of generating animal heat, is essentially a *chemical* one, it is yet favored or retarded by the condition of the nervous system. Though Liebig says that "chemical action is the sole *source* of it," it cannot be questioned that physiological experiments have demonstrated that *nervous* and *mental conditions* intimately *affect* its production, lessening or increasing the quantity of carbonic-acid liberated, and of oxygen consumed. The truth is, that injuries to the physical or nervous system, materially affect the chemical functions and processes; as, contrariwise, a disturbance of the last necessarily impairs or injures the former. The wisdom of nature is displayed in this—that in the healthy operations of the animal machine, those *elements of* *food* which stand related to the process of nutrition, do not disturb the *function of respiration*, nor, on the other hand, do the elements of respiration disturb the vital and nutritive functions, or (like alcohol) impair the nervous system. On the contrary, they are mutually dependent on, and necessary to, each other. It follows, therefore, that any element of respiration which does not assist that function *in harmony* with the laws of the nervous and nutritive functions, must be an *unnatural element of respiration.*

Liebig's views of the *modus operandi* of alcohol (as a chemical agent merely.)

Professor Liebig supposes, (Mr. Jeaffreson retails only a fractional part of that great man's theory,) THAT ALCOHOL IS AN ELEMENT OF RESPIRATION—"that the elements of alcohol combine with oxygen in the body; that its carbon or hydrogen are given off as carbonic acid and water." (p. 239.)

But, granting that some portion of this alcohol *may* become decomposed in the blood, the question arises, does this take place without injury to other functions of the system; or is its combustion effected naturally and beneficially? If not, its use must be as indefensible as ever.

"The oxygen (says Liebig) which has accomplished this change *must have been taken from the arterial blood.*" "It is, consequently, obvious, that by the use of alcohol, *a limit must rapidly be put to the change of matter* in certain parts of the body. The oxygen of the arterial blood, which, in the absence of alcohol, *would have combined with the matter of the tissues*, or with that formed by the metamorphosis of these tissues, now combines with the elements of alcohol. *The arterial blood becomes venous*, without the substance of the muscles having taken any share in the transformation.

"Now we observe, that the development of heat in the body, after the use of wine, increases rather than diminishes, *without the manifestation of a corresponding amount of mechanical force.*

"A *moderate quantity* of wine, in women and children unaccustomed to its use, produces a *diminution of the force necessary for voluntary motions.* Weariness, feebleness in the limbs, and drowsiness, plainly shew that *the force available for mechanical purposes*—in other words, the change of matter,—*has been diminished.*

"A diminution of the conducting power of the nerves of voluntary motion," that is, partial *paralysis,* "may doubtless take a certain share in producing these *symptoms;* but this must be altogether without influence on the sum of available force.

"What the conductors of voluntary motion cannot carry away for effects of force, must be taken up by the nerves of involuntary motion, and conveyed to the heart, lungs, and intestines. In this case, *the circulation will appear accelerated at the expense of the force available for voluntary motion;* but without the production of a greater amount of mechanical force, by the process of oxidation of the alcohol." p. 240.

Thus, according to "the laws or basis on which nutrition and respiration are carried on, as explained by this celebrated organic chemist, and which are so fearfully misunderstood by our shallow opponents, alcohol is to all intents and purposes A POISON.

History of Alcohol summed up.

Its vapor permeates rapidly through the membranes and tissues, and distributes itself every where throughout the whole body, but especially in the ventricles of the brain, which, in common with the whole nervous system, it first excites and then benumbs. It meets with the arterial blood, and to some extent *robs it of its oxygen*, being itself consumed by this gas. The *arterial* blood is thus deprived of its oxygen and becomes *venous*, by the influence of *alcohol*—and consequently there is to that extent a deficiency of oxygen for uniting with the metamorphised tissues. Thus the *natural change of matter*—(for nature designed the oxygen and decayed tissue to effect the change of arterial into venous fluid, not the oxygen and alcohol)—*is arrested*, and the whole system is thrown into an *unnatural state.* Heat is produced, no doubt, but it is *heat without force.* Hence a man under its influence is *inclined* to muscular exertion—*feels* as strong as Samson, and boasts as bravely as

Falstaff—and yet is helpless as a child. Alcohol is essentially unfavorable to the display of muscular power, because it *stops that change of matter which is the cause of force!*—Such is the *History of Alcohol* in its progress through the chambers and channels of the Living Temple!

Relation of alcohol to bile.

Another consideration also proves that it is an alien to the wants, and a rebel to the laws, of the animal kingdom. The *natural* elements of respiration, such as starch, sugar, and gum, are converted into the *natural fluid bile*, BEFORE they assist in sustaining the heat of the body, or in supporting respiration. *But alcohol cannot possibly be converted into bile.* It therefore is an unnatural element of respiration which *prevents the combustion of natural agents*, and deranges the usual vital and chemical processes of the animal economy.

I question, however, whether alcohol is so easily decomposed in the system as Liebig represents, and I contend that many physiological experiments (of which he does not seem to have had any cognizance,) support the position, that this irritating and most indigestible substance, as regards the great bulk of it taken at any time, passes off from the system, through the skin and lungs, *unchanged and undecomposed.* Be that, however, as it may—for the matter, as regards the question of teetotalism, is scarcely worth contending for,—the experiments of Drs. Prout and Fyfe have long ago demonstrated that the use of wine is *most adverse to the function of* RESPIRATION. Those experiments proved, that as long as the effects of alcohol were at all discernible upon the system, so long did the amount of carbonic acid expired continue *less than the healthy standard.* The results are thus briefly expressed by Dr. Copland, in his appendix to Richerand's *Physiology*, (1829.)

Experiments of Drs. Prout and Fyfe.

"The passions of the mind were found to have a great influence over its production; *the depressing passions diminishing its quantity*, and those of an opposite nature the reverse; exercise, when moderate, appeared to increase in some measure the quantity, but fatigue diminished it.

Alcohol most adverse to respiration.

"THE GREATEST DECREASE EXPERIENCED WAS FROM THE USE OF ALCOHOL AND VINOUS LIQUORS, especially when taken upon an empty stomach. In short, whatever *diminished the powers of life*, as low diet, &c., appeared to have the effect of diminishing the quantity of the carbonic acid." p. 626.

Thus direct experiment, so far back as 1813, (see Dr. Prout on Respiration, *Annals of Philosophy*, vol. ii. p. 328, and vol. iv. p. 331,) unites with the theory of Liebig in placing alcohol amongst THE FOES OF LIFE—opposing the change of matter, and consequently the digestion of food, the supply of nourishment, and the development of strength, and *diminishing the vital powers* in an extraordinary degree!

The Fat-fallacy.

The pernicious influence of alcohol upon the function of respiration, is further proved by the theory of Liebig, concerning the formation of fat. The FAT-FALLACY is a very prevalent one, and therefore it may not only be interesting, but instructive, to devote a short time to its exposition.

My attention was directed to this subject seven years ago, when, in a public discussion at Masham, my ministerial opponent urged the chemical objection, that *ale made men fat*, and that it was well known to farmers that *malt fed cattle faster than barley!*

Fat is not flesh.

I then contended that *fatness* was no proof of health or strength, but rather, beyond the most moderate degree, *an indication of disease*, the result of an impure condition of the circulating mass. This is evident from many facts. Look at the jockey who is training the racer for his greatest feat of speed and strength—does he fatten him up? No, he sweats him down. *Fat* is not *flesh;* not nerve or muscle, upon which activity and power depend;—it is a mere lifeless, unorganised compound, cast out of the system as superfluous, destitute of *nitrogen*, (an essential element of every living part,) and therefore a mere incumbrance to the system in putting forth its greatest physical powers. Does any one imagine that the stall-fed prize ox, so fat that he can scarcely walk, is healthier and stronger than he would be roaming his native hills?

Health and *strength* depend upon FRESH AIR, and the development, by means of EXERCISE of the muscular fibre of the system; whereas *fat* is *prevented* by the free respiration of fresh air induced by exercise. Cattle exposed to cold, and subject to constant motion, never grow fat. It is the same with men as with other animals. The Arab of the desert, who is in constant exercise, exhibits a mass of nerve and muscle which enables him to undergo an amount of fatigue almost incredible; but he is never fat, though he is healthy, and will frequently attain a patriarchal age. So with the aboriginal tribes of North America. Mr. Catlin, states that they enjoy great health and attain great age when not cut off by accident or war, and that they exhibit the finest specimens of physical prowess and stature. During a residence of eight years amongst them, never met with a fat Indian. As fatness *increases* with the absence, and *diminishes* with the presence, of the two chief conditions of health and strength, (fresh air and exercise,) it follows, that, other things being equal, WHATEVER TENDS TO INCREASE FATNESS, MUST TEND TO DECREASE HEALTH AND STRENGTH.

Fatness unfriendly to health.

Professor Liebig has advanced a very probable *theory* regarding the cause of these facts, and the origin of fat—which will more completely answer the objections under discussion.

What health is.

He thus philosophically defines the state of HEALTH. "That condition of the body which is called *health*, includes the conception of an equilibrium among all the causes of waste and of supply; and thus animal life is recognised as the mutual action of both; and appears as an alternating destruction and restoration of the state of equilibrium." p. 245. The question, then, arises—is obesity a condition accordant with this balance of health—this due proportion between supply and demand in the animal economy?

Origin of fat.

At pages 82 and 83 of his *Animal Chemistry*, he thus explains "the origin of fat in domesticated animals."

"The stall-fed animal eats and reposes merely for digestion. It devours, in the shape of nitrogenised compounds, far more food than is required for reproduction, or the supply of waste alone; and at the same time it eats far more of substances devoid of nitrogen than is necessary merely to support respiration, and to keep up animal heat. *Want of exercise and diminished cooling are equivalent to a deficient supply of oxygen;* for when these circumstances occur, the animal *absorbs much less oxygen than is required* to convert into carbonic acid the carbon of the substances destined for respiration. Only a small part of the *excess of carbon thus occasioned* is expelled from the body in the horse and ox, in the form of hippuric acid; and all the remainder is employed in the production of a substance which, in the *normal* state, only occurs in small quantity as a constituent of the nerves and brain. This substance is *fat*." [This nervous fat, however, is different from common fat, inasmuch as it contains *nitrogen*.] "The flesh of wild animals," [which are undoubtedly the strongest and most vigorous] "is devoid of fat; while that of *stall-fed* animals is covered with that substance. When the fattened animal is allowed to move more freely in the air, or compelled to draw heavy burdens, the fat again disappears.

"It is evident, therefore, that the formation of fat in the animal body is *the result of a want of due proportion between the food taken into the stomach and the oxygen absorbed* by the lungs and the skin."

Thus, on the principles of Liebig, FATNESS INDICATES A PRIOR DISTURBANCE OF THE BALANCE OF HEALTH, and its formation is evidently a wise and merciful provision for casting out superfluous elements of the blood, which have been either ignorantly introduced by the food, or unavoidably detained in consequence of a diseased or lowered action of the respiratory function.

When "cattle feed faster on malt than barley" it arises from the fattening quality of their food; when "men grow fat with drinking" it arises from the decreased expiration of the carbonic acid induced.

The proximate causes of fatness, therefore, are twofold, or positive and negative—*first*, the *introduction* of a larger quantity of *carbonaceous food* than the oxygen absorbed can consume or burn up; in short, the furnishing of a supply of fuel beyond the natural demand;—*second*, the *exclusion* by any means of that proportion of oxygen which is necessary to effect the combustion of the carbon or animal fuel introduced.

What feeds fastest.

"In the normal condition," says Liebig, "the quantity of carbon *given out* is exactly equal to that which is *taken in* the food, and the body acquires no increase of weight from the accumulation of substances containing much carbon and no nitrogen.—If we increase the supply of highly carbonised food, then *the normal* [natural] *state* can only be preserved on the condition that, by exercise and labour, the waste of the body is increased, and the supply of oxygen augmented in the same proportion. The production of fat is always *a consequence of a deficient supply of oxygen*, for oxygen is absolutely indispensable for the dissipation of the excess of carbon in the food." pp. 88-89.

Thus, if malt feeds faster than barley, it must be because it introduces *a greater* "*excess of carbon* in the food" of the cattle; and this theory exactly accords with the chemical analyses of barley and malt.

Analyses of barley and malt.

One hundred parts of these substances respectively, contain the following proximate or organic elements.

BARLEY *(As the Creator sends it.)*			MALT *(As man, by sabbath breaking,* makes *it.)*		
Gluten...	3		Gluten...	1	
Hordein	55		Hordein	2	
Total Nitrogenised Elements of Nutrition		58	*Elements of Nutrition* ...		13
Resin	1		Resin	1	
Gum	4		Gum	15	
Sugar	5		Sugar	15	
Starch	32		Starch	56	
Total Non-Nitrogenised Elements of Respiration		42	*Elements of Respiration*		87
Total		100	Total		100

We may now perceive why malt should feed faster than barley. The Creator in his infinite wisdom has wisely adapted barley to the natural wants of his creatures; he has ordained that it should have 58 per cent. of the elements of nutriment, (for the supply of waste,) and 42 of those of respiration, (for the purpose of fuel;) but man steps in and disturbs the proportion, *reducing* the 58 nutritious parts to 13, and *increasing* the 42 non-nutritious to 87! What might have been anticipated, *à priori*, from a disturbance of nature's harmonies, is actually realised by the fact. The animal to whom the malt is given has thereby introduced into its system *an "excess of carbon,"* and the excrescence *fat* is formed as a means of getting rid of it; while, were it subject to hard labor, it would be also deprived of the natural supply of nutriment.

Alcohol excludes oxygen.

Alcohol aids the formation of fat in the other way to which I have referred—by the exclusion of oxygen *from* the system, and the consequent retention of carbon *within* it.

In the production of this effect its *modus operandi* is manifold.

First, chemically, as an anti-septic, it retards the decay or "change of matter" within the system, in which operation it is aided by the empyreumatic matters with which it is combined, (the essential oils, œnanthic ether, &c.) Whatever opposes this, also opposes digestion and combustion, on which respiration depends. Hence a greater amount of combustible materials is necessarily retained within the circulating mass, than would otherwise have been the case.

Secondly, it tends to the same end *mechanically*, so to speak. The lungs and skin, appointed to discharge the carbon and hydrogen of the food and absorb the oxygen of the atmosphere, are now partly occupied in discharging the *alcohol* introduced into the blood, and, *as their capacity cannot be increased,* they cannot at the same time be employed in casting out the natural quantity of the carbon of the food, and also the unnatural alcohol and volatile oils of the intoxicating drink;—it follows, that just in proportion to the amount of the alcohol and essential oils thus *exhaled*, is the amount of carbon and hydrogen improperly *retained*. On this physical principle, also, the impossibility of either the liver or the respiratory apparatus perfectly performing double duty—an "excess of carbon," and a "deficiency of oxygen"—are produced.

Effects on the liver.

Thirdly, the use of alcohol, and just in proportion to the quantity taken, produces *physiologically* the same abnormal condition. On alcohol being absorbed, it passes along the various veins which unite in the portal vein, and thence, by its branches, it ramifies through the *liver*. "In this organ," says Dr. Craigie, in his *Elements of Physic*, "there is no doubt that the presence of these fluids, *in however diluted a form*, cannot fail to retard the motion of the blood, and consequently to produce congestion and accumulation, AND IMPEDE THE SECRETION OF THE GLAND." p. 74. But, as I have before observed, this organ is most intimately connected with the function of respiration;—its office is to eliminate and *prepare* the carbon and hydrogen of the food and of the decayed tissues (the animal fuel,) for the purpose of being more readily burnt up in the system;—and thus alcohol, by interfering with the function of the liver, causes the blood to be imperfectly prepared for the production of animal heat, and the consequent emission of carbonic acid from the lungs.—Passing from the liver to the heart, and thence to the lungs, alcohol produces a similar effect on the latter organ. "In this course," continues Dr. Craigie, "whatever may be believed and asserted to the contrary, they unquestionably *retard the motion of the blood*, and produce temporary *congestion of the whole system of the pulmonary capillary vessels*.—Various symptoms of accumulation within the chest, and pulmonary congestion, are induced." p. 75. Thus, as a natural sequence to this accumulation, the blood in the pulmonary artery, on the one hand, is *imperfectly exposed to the action of the oxygen*, and is therefore *not perfectly purified*. In other words, it retains an "excess of carbon," and is "deficient in oxygen," and therefore returns to the left chambers of the heart in a *state much less pure* than is requisite for the healthy circulation, and the due change of matter within the arterial or nourishing system, which augments the duty of the liver, retards combustion, prevents the production of animal heat, and increases the relative quantity of carbon in the blood.—By its irritating local action, as well as its general stimulating effect, its excessive use in a short time, or its more moderate use for a longer period, breaks down the machinery itself. In this way it actually seals up the vesicles of the liver, induces enlargement of the organ to repair the injury, which however is still continued to be inflicted by the drinker, and effects various other changes in its structure, all tending to diminish its secreting and elaborating power as an organ tributary to respiration.—The bronchial membrane also becomes more or less inflamed,—red, rough, and irritable,—secretes a new viscid or glutinous matter, which sticks strongly to its surface, and stops up the flues by which the oxygen of the air finds an entrance into the lungs, and thus combines with the already gorged condition of the pulmonary capillaries in still further deranging the function of respiration.

On the lungs.

Structural injury.

Effects on the nerves.

Whatever, also, by its general effect on the nervous system, exhausts the nervous fluid, (as a stimulant,) or impedes its transmission, (as a narcotic,) will also lower the vital actions generally, diminish assimilation, decrease combustion, and therefore limit the production of animal heat, and retard the liberation of carbonic acid from the system.

Contemplating, then, the manifold modes in which alcohol operates upon the animal economy, can we wonder at the result of the experiments of Drs. Fyfe and Prout? Grief, fear, and fatigue, says Dr. Copland, and in short, *whatever diminished the powers of life*, appeared to have the effect of diminishing the quantity of the carbonic acid expelled, but, says he, "THE GREATEST DECREASE EXPERIENCED WAS FROM THE USE OF ALCOHOL AND VINOUS LIQUORS."

It is thus that alcohol influences the function of respiration;—by retaining an "excess of carbon" and inducing a "deficiency of oxygen," it engenders, according to the theory of Liebig, which corresponds with many well-known facts, that morbid condition of the vital fluid which favors an obese and bloated habit.

Fat a merciful provision against sudden destruction.

Now, suppose that the accumulation of carbon in the system, arising from the presence and action of alcohol, were to be continued, and that no provision had been made by nature for the rectification of the mischief and the purification of the blood, what would be the inevitable result? An adult man, say, receives into his system about 2lbs. of oxygen daily, which combines, as I have explained, with the blood. This 2lbs. of oxygen will convert about 12½ oz. of carbon into carbonic acid gas, which escapes through the skin and lungs. But, if by drinking alcohol he depresses the function of respiration in the manner described, then, instead of absorbing 32 oz. of oxygen, he will only inspire 29 oz., and instead of consuming 12½ oz. of carbon, he will only expire 11 oz. The consequences are obvious. The venous blood becomes largely charged with carbon, the arterial blood imperfectly purified; and were this to be continued without any check or remedy, in a few weeks the evil would be augmented and aggravated to such an extent, that the mass of the arterial blood would become so highly carbonized and impure as to approximate to venous, and the whole system would sink and die for want of nourishment and stimuli.—To prevent this catastrophe, God has wisely ordained, that the "excess of carbon" shall be got quit of, and the "deficiency of oxygen" partly supplied, by the formation of fat;—thus, when starch and sugar are changed into fat, says Liebig, "in this process, in the formation of fat itself, there is *opened up a new source of oxygen*, a new cause of animal heat." p. 89. Fat, therefore, arises from a morbid condition of the blood,—and is in fact produced as a merciful provision for purifying the blood and preventing fatal consequences. Yet, such is the power of appetite and prejudice, that the mercy of God herein is made an occasion of sinning against his wise laws, and the result of this merciful process is referred to, as a *justification* of the use of that agent which, by carbonising the blood and deranging the healthy proportion of its elements, renders the formation of the lifeless and abnormal substance in question necessary as a guard against sudden destruction!

Therefore its causes should be shunned, not sought.

Such, Gentlemen, is my answer to the prevalent FAT-FALLACY."

APPENDIX B.

DR. PROUT'S EXPERIMENTS ON ALCOHOL.

Extracted from the Lancet, *April* 1, 1843, *vol.* 2, *p.* 17.

EFFECT OF ALCOHOL ON THE HUMAN SYSTEM.

"It may not be out of place here to recur to the admirable experiments of Dr. Prout, made in 1813, which have certainly not been supplanted by any of the observations of foreign chemists; and it were to be wished that Englishmen would attend rather more to what has been done in their own country. The controversy at present waging between Liebig and Dumas must make our countrymen pause before setting aside the experiments made in this country upon organic bodies, and may ultimately convince them that the methods of investigation pointed out by Dr. Prout, upwards of twenty years ago, are only beginning to force themselves upon the attention of foreign chemists. The passage referring to the effect of alcohol upon respiration, is to the following effect:—Alcohol and all liquors containing it which he tried, he found to have the remarkable property of diminishing the quantity of carbonic acid in the expired air *much more than anything else* which he made the subject of experiment. When *porter* was taken at dinner, the quantity was always much reduced below the natural standard, *while the reverse was the case when water was taken.*

All alcohol impedes respiration.

This induced him to extend his experiments, the result of which was, that *alcohol in every state and in every quantity, uniformly lessens*, in a greater or less degree, *the quantity of carbonic acid elicited*, according to the quantity and circumstances in which it is taken. When taken *on an empty stomach its effects were most remarkable*, the depression being almost instantaneous; after a short time the powers of the constitution appear to rally, and the quantity rapidly increases; then it sinks again, and afterwards rises slowly to the standard. On a full stomach, as after dinner, the effects of vinous liquors are very *slow*, *but no less sure* and remarkable. *Dr. Prout has even thought them* MORE PERMANENT. As long as the effects of alcohol are perceptible, so long is the quantity of carbonic acid gas emitted, below the standard. With Dr. Prout these effects went off with frequent yawnings, and with a sensation as if he had just awoke from sleep. Under these circumstances the quantity is much above the standard, and hence it may be concluded that *the system is then freeing itself from the carbon retained by the influence of alcohol.* The effect of *strong tea* is somewhat similar.

Wine less powerful but *more permanent* than spirits.

The following table is exceedingly interesting. The *first* column gives the hours of experiment; the *second*, the standard per-centage of carbonic acid at these hours; the *third*, the observed quantity; and the *fourth*, the state of the pulse :—

H. a.	M. m.	2	3	4	
11	40	4 . 0	4 . 0	70	Before taking *wine.*
12	10	4 . 05	3 .	72	Five minutes after taking three ozs.
12	30	4 . 0	3 . 4	76	} Example of oscillation.
1	0	3 . 95	3 . 1	78	
1	25	3 . 86	3 . 1	78	
3	0	3 . 66	3 .	84	20 minutes after a walk and dinner.
3	30	3 . 6	3 . 1	78	
3	55	3 . 56	3 .	74	10 min. after taking ½ pint of wine.
4	5	3 . 54	3 .	78	Slight effects of ditto observable.
4	30	3 . 50	2 . 70	78	Very strong effects of do. as vertigo.
5	0	3 . 46	2 . 90	76	
8	5	3 . 32	3 . 60	76	Effects gone off; frequent yawnings.

The natural standard was resumed 5h. 45min. after having taken the wine.

In this detail of experiments, which, however, is not isolated, as Dr. Prout repeated it often, we learn that *alcohol enormously depresses the combustion of the carbon of the system during its existence in the body*, if we may so judge of the presence of a cause by its effects. We cannot conclude with certainty that the alcohol suffers *no* combustion, it is true;—that it undergoes *a slow* combustion, *if any*, we may infer from its odour lingering about the person for a long period. The odour is not alcohol, yet we must remember that this odour is one of its most striking sensible properties, and enables us in many cases to detect its presence in minute quantities, when other means fail."

INFERENCES.

Inferences.

1. It has been seen that the supposition of alcohol being necessary in *cold climates* is erroneous, and contrary alike to common experience and scientific experiment.
2. Another case in which it has been supposed useful or innocent to employ alcohol, is in *starvation.* But, unless the object sought be the still greater depression of the system, this agent is peculiarly improper; for we learn that "on an empty stomach" its lowering action is almost instantaneous.
3. It has also been pleaded, as an apology for the use of alcohol, that in the form of wine, administered with food, it produces a very *different* effect.

This, however, is incorrect; for the *kind* of effect is still the same, though less violent for the time. But we learn also from these experiments, that what alcohol *loses in force*, by combination with other agents, it GAINS IN PERMANENCE of effect. The injury it inflicts is modified, not reversed.

Liebig's views chiefly chemical, not physiological.

N. B. Much misunderstanding as to the true character of Professor Liebig's opinions, appears to have arisen from neglecting to consider the fact, that his views are professedly advanced, not as being complete *physiological* or pathological doctrines, but as *chemical* doctrines; this, too, with the purpose, not of *destroying* ALL OTHER PHYSIOLOGICAL VIEWS of the operation of alcohol and other agents, but, *in order to complete the physiology of the subject*, by contributing more perfectly to our knowledge of the chemical relations and effects of those substances. As a physiological chemist he thus speaks of the chemical action of the characteristic principle of coffee and tea:—

"Without entering minutely into the medical action of caffeine (theine,) it will surely appear a most striking fact, even if we were to deny its influence on the process of secretion, that this substance, with the addition of oxygen and the elements of water, can yield *taurine*, the nitrogenised compound peculiar to bile." Sec. 87.

"If an infusion of tea contain no more than the $\frac{1}{10}$th of a grain of caffeine, still, if it contribute in point of fact to the formation of bile, *the action, even of such a quantity, cannot be looked upon as a nullity.* Neither can it be denied that in the case of an *excess* of non-azotised food and a *deficiency* of motion, which is required to cause the change of matter in the tissues, and *thus* to yield the nitrogenised products which enter into the composition of the bile; that *in such a condition*, the health may be benefited by the use of compounds which are capable of supplying the place of the nitrogenised product produced *in the healthy state* of the body, and essential to the production of an important element of respiration. IN A CHEMICAL SENSE—*and it is this alone which the preceding remarks are intended to shew*—caffeine, theine, asparagine, and theobromine, are, *in virtue of their composition*, better adapted to this purpose than all other nitrogenised vegetable principles." Sec. 88.

Dr. Liebig does not here mean to say, that caffeine, (the principle both of coffee and tea,) will not injure the stomach or affect the nerves and the respiration; or that it may properly be administered in health, where proper food and exercise have been taken, to supply, by a natural process, the *taurine* of the bile;—but he would be understood "in a chemical sense alone." In other words, *after* tea and coffee have operated physiologically on other organs, they may, he supposes, supply, by virtue of their chemical composition, the deficiency of *taurine* created by improper food and insufficient exercise. That is, counteract, chemically, one of the consequences of the use of alcohol.—Both with reference, then, to caffeine and alcohol, justice demands that the statements of Liebig should be strictly limited to their CHEMICAL ASPECT, not advanced in opposition to the settled results of physiology.

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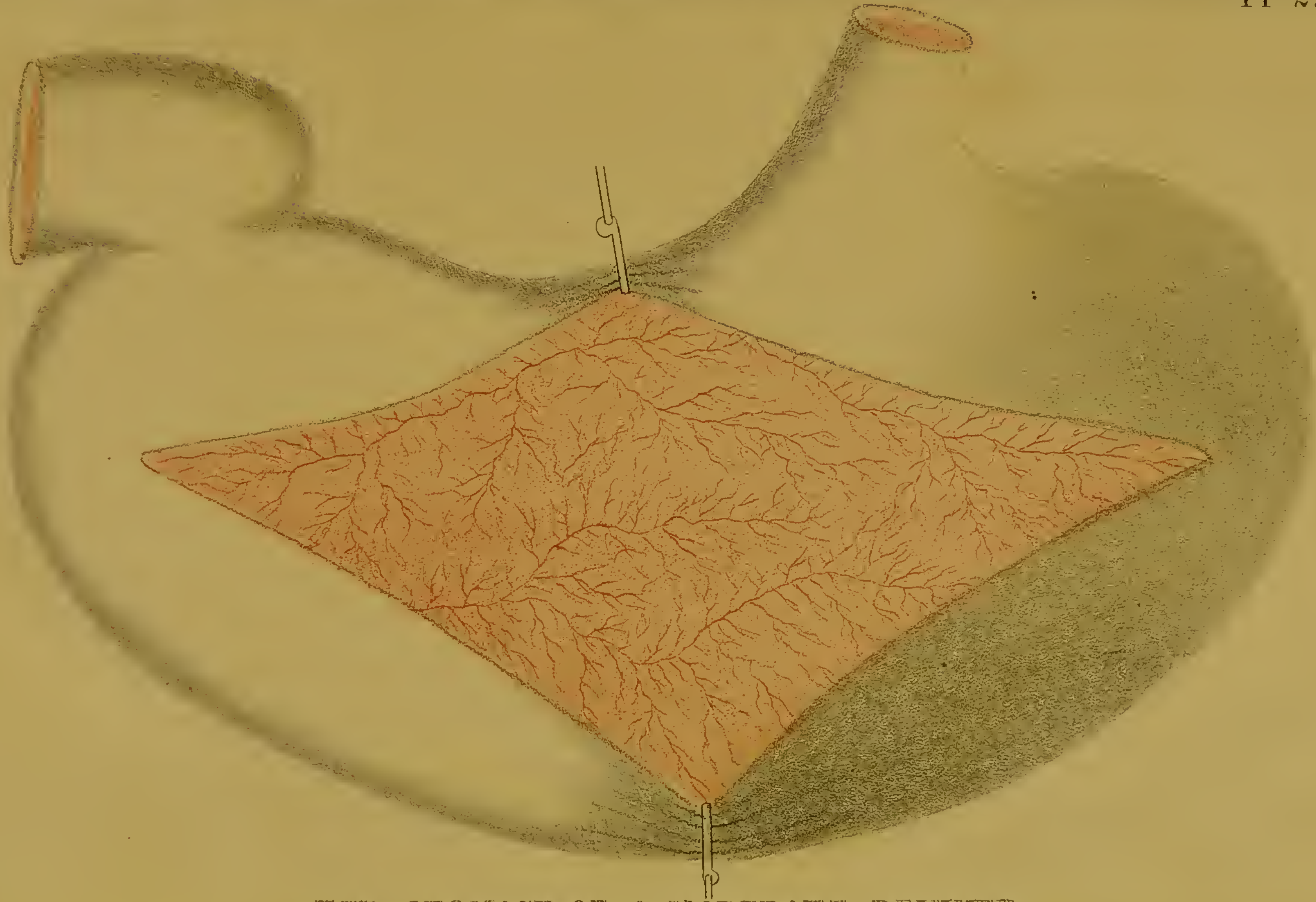
Pl 2.



THE STOMACH OF A MODERATE DRINKER.

J.F. Masser Lith Leeds.